1661 - 1707

January 30, 1986

QUALITY ASSURANCE PROJECT PLAN

OFF-SITE SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

HARGIS + ASSOCIATES, INC.

Consultants in Hydrogeology

HARGIS + ASSOCIATES, INC.

(619) 454-0165

January 30, 1986

JAN 31 1986

LOS ANGELES

Ms. Therese Gioia
Environmental Protection Agency (T-4-2)
Toxics and Waste Management Division
215 Fremont Street
San Francisco, CA 94105

RE: Montrose Site, Torrance, California

Dear Ms. Gioia:

Enclosed please find three copies of the reports entitled:

1) **QUALITY ASSURANCE PROJECT PLAN**
OFF-SITE SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

2) **OFF-SITE SAMPLING PLAN**
MONTROSE SITE
TORRANCE, CALIFORNIA

Comments from your letter of January 2, 1986 and our meeting of January 21, 1986 have been addressed.

If you have any questions, please do not hesitate to contact me.

Sincerely,

HARGIS + ASSOCIATES, INC.

Edward A. Nemecek
Senior Associate

cc: Mr. Angelo Bellomo, DOHS
Mr. Robert P. Ghirelli, RWQCB
Mr. Dan Greeno, Montrose Chemical
Karl Lytz, Esq., Latham & Watkins

003/gioia.ltr

HARGIS · ASSOCIATES

QUALITY ASSURANCE PROJECT PLAN

OFF-SITE SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

January 30, 1986

Prepared by
Hargis + Associates, Inc.
for
Montrose Chemical Corporation

Approved by:

_________________________________, QA Project Manager, H+A
signature date

_________________________________, Project/Task Manager, H+A
signature date

_________________________________, Project Officer, USEPA
signature date

_________________________________, QA Officer, USEPA
signature date

HARGIS + ASSOCIATES, INC.

QUALITY ASSURANCE PROJECT PLAN

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MONTROSE SITE
TORRANCE, CALIFORNIA

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QUALITY ASSURANCE PROJECT PLAN

OFF-SITE SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared for the off-site sampling program for the Montrose site in Torrance, California. Adherence to the quality assurance/quality control program outlined in this document will insure that the data collected are precise, accurate, complete, and representative. Quality assurance is defined as the integrated program designed for assuring reliability of monitoring and measurement data. Quality control is defined as the routine application of standard procedures to obtain prescribed standards of performance in the monitoring and measurement process.

Quality assurance procedures such as tracking, reviewing, and auditing must be implemented to insure that field and laboratory data are of high quality and that all project work is performed in accordance with professional standards, EPA and other appropriate governmental regulations and guidelines, and specific project goals and requirements. Outlined in this Quality Assurance Project Plan (QAPP) are the procedures to be followed to insure the quality and reliability of data collected in the study area.

The QAPP covers each of the following activities:

- o Sample collection, control, chain-of-custody and analysis.

- Required field instruments and sampling equipment, including containers used and methods of sample preservation.
- Site-specific sampling methodology.
- Site-specific testing methodology.
- Disposal of drill cuttings.
- Decontamination procedures.
- Disposal of rinsate and wastes generated by decontamination procedures.
- Types of field measurements required.
- Data requirements and analytical procedures to be used.
- Storage and shipping methods.
- Chain-of-custody procedures.
- Site safety procedures.

QUALITY ASSURANCE OBJECTIVES

The overall quality assurance objectives are to develop and implement procedures for obtaining and evaluating data that can be used to assess site hazards, aid in developing alternative remedial actions, and be defensible in a court of law. In order to provide defensible data, it is necessary that all measurement data have an appropriate degree of accuracy and reproducibility. All samples collected and all field measurements must be representative of actual field conditions. Specific quality assurance objectives have been established for accuracy, precision and completeness of analytic results. Accuracy shall be evaluated in spiked samples in terms of percent recovery; percent recovery shall be within ±20% of the assumed total analytic concentration. Precision shall be evaluated for duplicate samples in terms of percent difference; percent difference shall be no greater than 20%. Completeness of analytic results will be evaluated by comparing the number of defective results to the number of requested analyses. Measurement completeness, C, shall not be less than 95%.

The QAPP presented herein is designed to implement the procedures necessary to maintain a consistent quality of data. This consistency will be accomplished through the formal standardization and documentation of field techniques and activities. All field activities will be planned in advance to insure consistency with overall project objectives. Actual field and laboratory activities will be performed by properly trained and qualified personnel and will conform to specific procedures outlined in subsequent sections of the QAPP. Project deliverables resulting from these activities will be reviewed for completeness, reliability, accuracy, and conformance with specific procedures.

PROJECT DESCRIPTION

The Montrose site occupies about 13 acres in Torrance, California. The area is bounded by a railroad right-of-way and Normandie Avenue on the east, Jones Chemical Company and the Los Angeles Department of Water and Power easement to the south, a vacant lot to the west, and the McDonnell-Douglas facility to the north. The surrounding area consists of mixed residential, commercial, and industrial uses. In addition, the Del Amo hazardous waste site is located about one-half mile southeast of the Montrose site.

Between 1947 and 1982, Montrose Chemical Corporation operated a DDT manufacturing facility at the site. In 1972, the use of DDT was banned in the United States. The use of DDT was not banned in other countries, and Montrose continued to manufacture and export DDT until 1982, when the facility was closed and subsequently dismantled.

Previous investigations addressing the potential for migration of contaminants from the Montrose site include off-site sampling of sediments and surface runoff. These investigations were conducted by the U.S. Environmental Protection Agency (EPA) and its contractors, California Department of Health Services (DOHS), and the Regional Water Quality Control Board, Los Angeles Region. An EPA investigation in November 1982 detected DDT in surface water runoff and sediments off-site of the Montrose property. The results of these investigations were the basis for issuance of administrative orders by the EPA and the Los Angeles Regional Water Quality Control Board in May 1983.

In October, 1985 a consent order between the EPA and Montrose was finalized. The RIW tasks, outlined in the EPA Remedial Investigation/Feasibility Study Final Workplan, Montrose Facility Site (Torrance, California), Metcalf and Eddy, Inc., October 1984 as modified by Appendix A of the consent order, are designed to obtain information necessary for the performance of a feasibility study. These tasks include off-site soil, sediment, and surface water sampling, on-site soil sampling and groundwater monitoring of the Bellflower aquitard and Gage aquifer. Samples will be analyzed for the Target Chemicals (Sampling Plan, page 4). This QAPP addresses only the first phase of RIW tasks and includes the off-site soil, sediment, and surface water tasks. The RIW will be performed for Montrose Chemical Corporation under the direction and supervision of Hargis + Associates subject to the review and approval of the EPA. Metcalf and Eddy, Inc. will act as oversight personnel for the EPA.

The objective of the sampling program is to determine the extent of off-site soil, sediment, and surface water contamination which may have resulted from activities at the Montrose site. Some off-site sampling activities have already been conducted. Additional off-site sampling will be performed in phases, based on results of the previous sampling. A phased approach will allow interim evaluation of the analytical results, and provide a basis for determining the number and location of additional samples should they be needed.

The off-site field activities will include soil sampling, sediment sampling, and surface water runoff sampling. A complete report incorporating laboratory analytical results and evaluation of the data collected during the off-site sampling program will be prepared.

Nine areas have been identified for sampling activities. These areas include:

1. The perimeter of the site;

2. The utility easement area south of the site;

3. The drainage ditch that runs parallel to Normandie Avenue from the site to the catchment basin at Farmer Brothers;

4. An historical drainage area from the main gate at Jones Chemical through the DWP substation, and under both Farmer Brothers' main buildings to the catchment area;

5. The Kenwood Drain, a storm sewer line which receives runoff from the site;

6. The Torrance Lateral;

7. The Dominguez Channel;

8. Consolidated Slip;

9. Residential areas in the vicinity of the site;

PROJECT ORGANIZATION AND RESPONSIBILITY

Figure 1 presents the proposed quality assurance (QA) organizational chart for the sampling plan showing the individuals responsible for each element of the overall program. The key individual responsible for quality assurance is the QA Manager. The QA Manager for this project is Mr. Edward Nemecek of Hargis & Associates, Inc. QA activities are reviewed in bi-weekly meetings between the QA Manager and the Project/Task Manager.

-Maintain corporate oversight of QA/QC activities

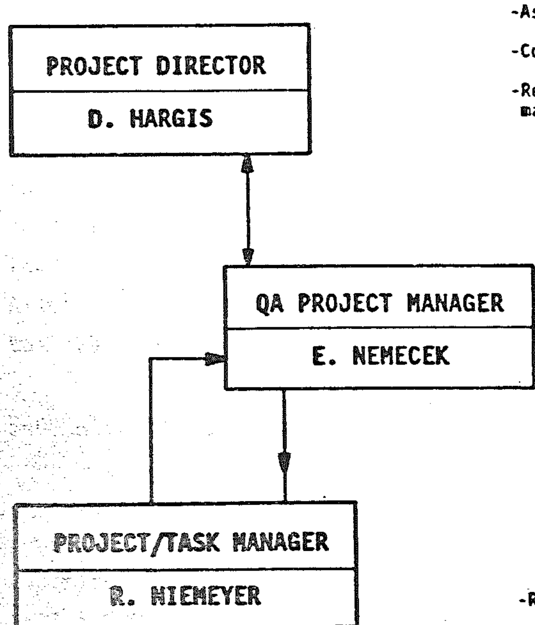
-Review and approve QAPP

-Review and approve field operation procedures

-Assure that approved procedures meet project objectives

-Coordinate project activities with QA Project Manager

-Responsible for implementation of recommendations made by QA Project Manager



-Review and approve QAPP

-Review and audit field sampling and Chemical analysis procedures

-Review and approve procedures for submission of samples

-Responsible for preparation and analysis of QA audit samples

-Review and forward to EPA with appropriate laboratory documentation lab data package

-Responsible for collection of representative samples

-Assure that samples are collected, logged, and analyzed in accordance with approved QA/QC procedures

-Assure that all data are completely and accurately recorded

-Record and report any problems or changes associated with field sampling and chemical analysis activities

FIGURE 1. QUALITY ASSURANCE ORGANIZATIONAL CHART

LABORATORY ANALYSIS

ANALYTICAL PROCEDURES/DATA REQUIREMENTS

All samples collected during this project will be analyzed for the Target Chemicals, except neighborhood surface soil samples where the transport mechanism away from the site precludes a reasonable expectation of detecting volatile organics. Laboratory analyses will be in accordance with the standard analytical procedures established by the EPA. These procedures and methods will be followed by the laboratory. In addition to the laboratory's own internal QAQC procedures described in Appendix A, Laboratory Quality Control, 10% of all samples submitted to the lab will be resubmitted as duplicate samples. The laboratory shall submit a complete lab data package, including EPA requested documentation, to Hargis + Associates for an analysis of the precision, accuracy , and completeness of the lab results.

General Laboratory Requirements

In general, the laboratory will adhere to those recommendations as promulgated in 21 CFR Part 58, "Good Laboratory Practices" and criteria described in "Methods for Chemical Analysis of Water and Wastes", 1979 (EPA-600/4-79-020).

Analytical Requirements

All reagents will be standard laboratory quality. Where applicable, reference standard solutions will be traceable to the National Bureau of Standards (NBS). Each new lot of reagent grade chemicals will be tested for quality of performance. These chemicals will be tested by injection into a gas chromatograph (GC) to determine the extent of interference in the GC profile.

All glassware used in organic analyses requires special cleaning. Plasticware will not be used because other organic compounds may be extracted by solvents and produce interfering peaks on the gas chromatogram.

Laboratory pure water is prepared by a special deionized water system augmented by individual filter cartridges and polishers located at each outlet point. The polishers include special particulate filters, organic resins, and inorganic resins.

Specially deionized water which has been boiled and purged with nitrogen gas will be used for volatile/priority pollutant analyses. Water prepared in this manner should be free of contamination and be free of interference peaks when injected into the gas chromatograph.

Aliquots from brass sleeve soil samples are obtained by reaming out the center of each sample after approximately one centimeter of sample from both ends of the sleeve has been scraped off.

All water samples submitted for analysis of volatile organics or priority pollutants must be accompanied by a trip blank. Trip blanks are prepared in the field prior to shipment to the laboratory using certified organic-free water, stored alongside the collected samples and shipped back to the laboratory for analysis. Trip blanks are analyzed with the field samples to determine whether the sample bottles were exposed to contaminants during handling and transit or if samples were cross-contaminated. The laboratory will not be aware of which sample is the trip blank. Additionally, a laboratory pure water blank is analyzed along with all water samples submitted for analyses. This method (reagent) blank is processed through all procedures, materials, and labware used for sample preparation. In cases of non-aqueous samples, reagent blanks serve as method blanks.

For each analyte a calibration standard is prepared in the laboratory by dissolving a known amount of the analyte in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. A minimum of three (3) calibration standards will be used in generating a standard curve for all analyses. By using the slope-intercept equation for the standard curve in conjunction with the gas chromatograph readings from the field sample, the concentration of the analyte may be determined.

A laboratory control standard is prepared in the same manner as a calibration standard. The final concentration calculated from the known quantities is the true value of the standard. The important difference in a laboratory control standard is that it is not carried through the same process used for the environmental samples, but is injected directly onto the gas chromatographic column. A laboratory control standard result is used to validate an existing concentration calibration standard file or calibration curve. The check standard can provide information on the accuracy of the total analytical method independent of various sample matrices.

A sample spike is prepared by adding a known amount of a pure compound to the environmental sample before extraction of extractables. The compound is the same as that being assayed in the environmental sample. These spikes simulate the background and interferences found in the actual samples and the calculated percent recovery of the spike is taken as a measure of the accuracy of the total analytical method. When there is no change in volume due to the spike, it is calculated as follows:

$$P = \frac{(T-X)\ 100}{T}$$

P = Percent Recovery

X = Measured value of analyte concentration in the sample before the spike is added

T = Assumed true value of analyte concentration in the sample after the spike is added. Percent recovery must be within ±20% of the known concentration.

Internal standards are prepared by adding a known amount of pure compound to the environmental sample, and the compound selected is not one expected to be found in the sample, but is similar in nature to the compound of interest. Internal standards are added to the environmental sample just prior to analysis. Internal standards and surrogate spikes are different compounds. The internal standard is for quantification purposes using the relative response factor, while surrogate spikes indicate the percent recovery and therefore the efficiency of the methodology.

Because of the limited number of replicate samples, precision cannot be evaluated in terms of standard deviations. Consequently, outlier testing is not possible. However, the precision of an analytical method can be evaluated from internal lab and field duplicates by calculating the percent difference between the duplicate sample results.

$$PD = 2\,\frac{(D1 - D2)}{(D1 + D2)} \times 100$$

PD = Percent Difference
D1 = First Sample Value
D2 = Second Sample Value (duplicated)

The limit for the Percent Difference between duplicates should not exceed 20 percent. Since standard deviations cannot be calculated, representativeness of samples will be assured by adhering to standard sampling and analysis procedures.

An analysis of sample completeness will be conducted to limit the number of defective results in future sampling episodes. Completeness can be described as the ratio of acceptable laboratory results to the total number of analyses requested. Criteria for defective results may include exceeded holding times, percent recoveries greater than 20%, or unsatisfactory supporting data such as dates, locations, or sample identity numbers. An analyses of sample completeness will be conducted after each sampling round results are returned. Completeness is defined as:

$$C = \left(1 - \frac{\text{number of defective results}}{\text{total number of requested analyses}}\right) 100$$

A C value less than 95% will indicate corrective action in order to avoid repeating similar problems in future sampling rounds.

Data Requirements

Table 1 lists the EPA organic priority pollutants. EPA requires a specific analytical method for each compound. The Sampling Plan specifies the Target Chemicals to be analyzed for in each field sample. Sample container preparation, sample handling and preservation techniques, and laboratory analytical methods are summarized in Tables 2, 3 and 4.

TABLE 1

EPA PRIORITY POLLUTANTS

1. acenaphthene
2. acrolein
3. acrylonitrile
4. benzene
5. benzidine
6. carbon tetrachloride (tetrachloromethane)
7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
10. 1,2-dichloroethane
11. 1,1,1-trichloroethane
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloroethyl) ether
18. 2-chloroethyl vinyl ether (mixed)
19. 2-chloronaphthalene
20. 2,4,6-trichlorophenol
21. parachlorometacresol
22. chloroform (trichloromethane)
23. 2-chlorophenol
24. 1,2-dichlorobenzene
25. 1,3-dichlorobenzene
26. 1,4-dichlorobenzene
27. 3,3-dichlorobenzidine
28. 1,1-dichloroethylene
29. 1,2-trans-dichloroethylene
30. 2,4-dichlorophenol
31. 1,2-dichloropropane
32. 1,3-dichloropropylene
33. 2,4-dimethylphenol
34. 2,4-dinitrotoluene
35. 2,6-dinitrotoluene
36. 1,2-diphenylhydrazine
37. ethylbenzene
38. fluoranthene
39. 4-chlorophenyl phenyl ether
40. 4-bromophenyl phenyl ether
41. bis(2-chloroisopropyl) ether
42. bis(2-chloroethoxy) methane
43. methylene chloride (dichloromethane)
44. methyl chloride (chloromethane)

TABLE 1 -- CONTINUED

45. methyl bromide
46. bromoform (tribromomethane)
47. dichlorobromomethane
48. chlorodibromomethane
49. hexachlorobutadiene
50. hexachlorocyclopentadiene
51. isophorone
52. naphthalene
53. nitrobenzene
54. 2-nitrophenol
55. 4-nitrophenol
56. 2,4-dinitrophenol
57. 4,6-dinitro-o-cresol
58. N-nitrosodimethylamine
59. N-nitrosodiphenylamine
60. N-nitrosodi-n-propylamine
61. pentachlorophenol
62. phenol (4APP method)
63. bis(2-ethylhexyl) phthalate
64. butyl benzyl phthalate
65. di-n-butyl phthalate
66. di-n-octyl phthalate
67. diethyl phthalate
68. dimethyl phthalate
69. benzo(a)anthracene (1,2 benzanthracene)
70. benzo(a)pyrene (3,4-benzopyrene)
71. 3,4-benzofluoranthene
72. benzo(k)fluoranthane (11,12-benzofluoranthene)
73. chrysene
74. acenaphthylene
75. anthracene
76. benzo(ghi)perylene (1,12-benzoperylene)
77. fluorene
78. phenanthrene
79. dibenzo (a,h) anthracene
80. indeno (1,2,3-cd) pyrene
81. pyrene
82. tetrachloroethylene
83. toluene
84. trichloroethylene
85. vinyl chloride (chloroethylene)
86. aldrin
87. dieldrin
88. chlordane (tech. mixture & metabolites)
89. 4,4' - DDT
90. 4,4' - DDE (p, p' DDX)
91. 4,4' - DDD (p, p'-TDE)

TABLE 1 -- CONTINUED

92. alpha-endosulfan
93. beta-endosulfan
94. endosulfan sulfate
95. endrin
96. endrin aldehyde
97. heptachlor
98. heptachlor epoxide
99. alpha-BHC
100. beta-BHC
101. gamma-BHC (lindane)
102. delta-BHC
103. PCB-1242 (Aroclor 1242)
104. PCB-1254 (Aroclor 1254)
105. PCB-1221 (Aroclor 1221)
106. PCB-1232 (Aroclor 1232)
107. PCB-1248 (Aroclor 1248)
108. PCB-1260 (Aroclor 1260)
109. PCB-1016 (Aroclor 1016)
110. Toxaphene
111. Antimony (Total)
112. Arsenic (Total)
113. Asbestos (Fibrous)
114. Beryllium (Total)
115. Cadmium (Total)
116. Chromium (Total)
117. Copper (Total)
118. Cyanide (Total)
119. Lead (Total)
120. Mercury (Total)
121. Nickel (Total)
122. Selenium (Total)
123. Silver (Total)
124. Thallium (Total)
125. Zinc (Total)
126. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

TABLE 2

SAMPLE CONTAINER PREPARATION

	EPA Methods			
	608	8080	624	8240
Sample Containers				
40 ml VOA vial	--	--	Detergent wash, tap and distilled rinse	Detergent wash, tap and distilled rinse
16 ounce glass jar	Detergent wash, tap and distilled rinse	Prechilled to 4°C	--	--
6-inch brass sleeve	--	Prechilled to 4°C	--	Prechilled to 4°C
1-liter amber glass bottle	Detergent wash, tap and distilled rinse	--	--	--

TABLE 3

SOIL SAMPLE HANDLING, PRESERVATION, AND ANALYSIS

TYPE OF ANALYSIS	SAMPLE CONTAINER	PRESERVATION	ANALYTICAL METHODS
Monochlorobenzene, Benzene Dichlorobenzene Chloroform Acetone	Sealed brass tube sleeve with teflon-lined threaded cap	Refrigerate to 4 degrees C	EPA Method 8240
Total DDT Total BHC	Sealed brass tube sleeve with teflon-lined threaded cap	Refrigerate to 4 degrees C	EPA Method 8080

TABLE 4

WATER SAMPLE HANDLING, PRESERVATION, AND ANALYSIS

TYPE OF ANALYSIS	SAMPLE CONTAINER	PRESERVATION	ANALYTICAL METHODS
Monochlorobenzene Benzene Dichlorobenzene Chloroform Acetone	40-ml glass vials with teflon-lined threaded caps	Refrigerate to 4 degree C	EPA method 624
Total DDT Total BHC	1-liter glass bottle with teflon-lined threaded caps	Refrigerate to 4 degree C	EPA method 608

SAMPLING PROCEDURES

Because these data will be used to determine the extent and nature of potential contamination, the procedures presented in this section are designed to insure that: 1) all samples obtained are collected in a manner consistent with project objectives; 2) all samples are identified, preserved, and transported in a manner such that data are representative of the actual site conditions and no information is lost in sample transfer.

Prior to each sampling round, the Project/Task Manager will assure that all sample containers have been prepared to EPA laboratory method standards (Table 2).

SOIL SAMPLING

Soil samples will be collected from sampling locations around the perimeter of the Montrose site, the power company easement area south of the site, the historical drainage area and along four transects located in the drainage ditch adjacent to Normandie Avenue. Samples will be collected every foot to a depth of five feet at each sampling location. Additional samples will be obtained where changes in lithology or any unusual discolorations of the soil occur. The following procedure will be used to obtain soil samples:

- o Review project objectives with all personnel and identify boring sites to be drilled each day.
- o Review health and safety procedures with all personnel.
- o Record background OVA measurements every 3 hours.
- o Record daily weather conditions and site characteristics.

- Photograph unusual sample locations and conditions.
- Cover ground surface around the immediate borehole site with plastic sheeting to prevent mixing of surface and subsurface soil.
- Assemble Modified California Drive Sampler with brass tubes and drive it into the ground.
- Record OVA measurements of each sample tube.
- Cap ends of brass tubes with teflon liner and plastic end cap. Secure cap with electrical tape.
- Label each tube using predetermined numbering system and place in plastic bag and immediately store in refrigerated chest.
- Note any difficulties in sampling, including unusual drilling characteristics.
- Decontaminate split-spoon sampler by TSP detergent wash, water rinse, and deionized water rinse. All wash water will be stored at the Montrose site until results of soil analyses are available. The wash water will be disposed of in an appropriate manner depending on the results of the analyses.
- Complete chain-of-custody forms, laboratory analysis schedules and appropriate transmittal letters.
- Preserve and package groups of samples and deliver daily to designated laboratory.

NEIGHBORHOOD SURFACE SOIL SAMPLING

Surface soil samples will be collected in the vicinity of the site using a shovel or trowel. Sufficient soil will be collected at a depth less than 0.25 feet from each location to fill a 16 ounce glass jar. Sample containers will be labeled, sealed with electrical tape, placed in individual plastic bags and immediately stored in a refrigerated ice chest. Samples collected will be placed as undisturbed as possible in clean glass containers with teflon-lined lids. Glass containers have been chosen due to their relative inertness to the chemicals of concern. All sampling devices will undergo a TSP detergent wash, a water rinse and a deionized water rinse between sampling events.

A background surface soil sample will be collected approximately five miles southwest of the site and an exact location will be reported with the laboratory analysis.

SURFACE WATER SAMPLING

Surface water samples will be collected in the lined drainage ditch originating at Jones Chemical Company, and in the unlined ditch that parallels Normandie Avenue. Surface water samples will also be taken from the Torrance Lateral, the Dominguez Channel and Consolidated Slip. Collection of some of these samples will depend on adequate precipitation events to sustain surface water runoff at the sampling locations other than Dominguez Channel and Consolidated Slip.

At each surface water sample location except those at Consolidated Slip, two 40 ml glass VOA vials and one 1-liter amber glass bottle will be filled by immersing the sample container in the water. The sample containers will be rinsed with sample water before the sample is collected. The water sample will be collected below the water surface with the mouth of the bottle facing upstream. Zero head space in each VOA vial will be ensured by inverting the vial and gently tapping on the cap. If air bubbles appear the vial will be reopened and additional sample will be added. This procedure will be repeated until zero head space is confirmed.

Water samples at Consolidated Slip require the same sample containers but will be taken at 0.3 and 0.6 of the total depth at each sediment sampling location and will be collected in one container. A PVC point source bailer will be used to obtain the samples.

The following procedure will be used to obtain water samples:

- o Determine water temperature at time of sampling.
- o Determine pH of sampled water.
- o Within the off-site area of study determine inflow and outflow points of storm runoff water.
- o Record weather conditions and other observations.
- o Observe and note physical characteristics of the water such as odor, color, turbidity, and vegetation.
- o Measure and record the depth of the water.
- o Sketch the areas where samples are collected and the inflow and outflow points of storm runoff water.
- o Collect sample by lowering a collection container on a pole toward the bottom of the water body and collect the sample in the teflon beaker. Lift the pole up and transfer the sample to the sample container.

- Immediately cap samples to be analyzed for volatile Target Chemicals.

- Label each sample container using the predetermined numbering system and fill out chain-of-custody record, lab schedules, and transmittal documents.

- Clean collection containers thoroughly between sampling events with TSP detergent and deionized water.

- Package samples for shipment to the lab.

SAMPLE PRESERVATION

All soil and water samples will be placed in clear plastic bags and stored in Coleman-type ice chests with plastic air bubble packing material and blue ice and/or double bagged ice as necessary. Samples will be transported to the laboratory within 24 hours of collection. The ice chests will be sealed with tape. Transmittal letters, chain-of-custody documents, and lab schedules will be sealed in two zip-lock bags taped to the underside of the ice chest lid.

SAMPLE HANDLING, PACKAGING, SHIPMENT

Each soil and water sample will be labeled in the field with the location, date, and time of sampling, collector's name and company, and the analysis to be performed (Figure 2). Sample container lids will be secured with electrician's tape. All pertinent data concerning each sample will be recorded in a field log book. The sample will be placed in a clear plastic bag and immediately stored on blue ice and/or double bagged ice in a Coleman-type plastic ice chest with plastic air bubble packing material. Samples will remain in the custody of the sample collector until transport to the laboratory. Letters of transmittal, chain-of-custody documentation, and laboratory schedules for analyses to be performed will be prepared at the end of each sampling event, and sealed inside each shipment to the laboratory. Water and soil samples will be transported to the laboratory by vehicle at the end of each sampling day.

BLANK AND DUPLICATE SAMPLES

Each shipment of water samples will contain one blank water sample of certified organic free water for each type of sample container included in the shipment. In most cases, the blanks will consist of two 40 ml vials and one 1-liter glass bottle sealed, labeled, packed and stored in a manner identical to the other water samples collected. The identity of blank water sample will be unknown to the laboratory performing the analysis.

Duplicate water samples will be included in each sampling round at a rate of 10% per matrix. The duplicates will be collected, sealed, labeled, packed and stored in a manner identical to the other water samples collected. The identity of the duplicate water samples will not be known to the laboratory performing the analysis.

Samples will be provided to the EPA or their representative in the field at their discretion. Since true splits of soil samples are not possible to obtain without compromising sample integrity, soil samples will be prepared in the field by marking the common ends of adjoining six inch brass tubes lining a split-spoon sampler. Both tubes will be sent to the lab unextruded; however, only the soil in the marked half of each tube will be analyzed.

FIGURE 2. SAMPLE IDENTIFICATION LABEL

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology

2223 Avenida De La Playa Suite 300
La Jolla, California 92037 (619) 454-0165

Client	Date
Project #	Sample ID
Initials	Time

Analyze for

Preservative/Special Instructions:

FIELD MEASUREMENTS AND CALIBRATION OF EQUIPMENT

Field equipment used to perform various measurements during this investigation will include a YSI Model 33 conductivity meter or equivalent for measuring electrical conductivity of water samples, a Corning Model 103 pH meter or equivalent for measuring pH, and a field thermometer.

The probes on the conductivity meter and pH meter will be rinsed in distilled water prior to each use. Prior to each use the pH meter is calibrated in pH 4 and pH 10 buffer solutions made up from Hydrion Buffer Chemvelopes. The water sample for which pH and electrical conductivity are determined will not be used to fill sample containers. All manufacturer's instructions for use of the instrument will be followed. During all drilling operations, an organic vapor analyzer will be routinely used for detection of volatile organic emissions. Although no significant levels of volatile compounds are expected, the instrument will be employed for safety purposes. If readings of volatiles greater than ten parts per million above background are detected, appropriate safety actions will be taken in accordance with the off-site Health and Safety Plan located in Appendix A of the Off-site Sampling Plan.

DOCUMENTATION

Each sample will be documented to insure timely, correct, and complete analysis for all parameters requested.

This documentation system provides a methodology that individually identifies, tracks, and monitors each sample from the point of collection through final data reporting. At the Montrose site, the appropriate documentation includes field notebooks that provide the time, method and conditions of sampling, letters of transmittal to the laboratory, laboratory schedules, chain-of-custody documents and laboratory results.

Use of the forms is self-explanatory and generally requires the following minimum information: sample number, project code/case number, sample site name/code, sampling date, sampling personnel, shipping method and date, sample description, estimated sample concentration, sample volume and number of containers, sample destination, preservatives used, analyses required and special handling procedures.

Where appropriate, preprinted and prenumbered adhesive sample labels will be secured to the sample containers by the sampler (Figure 2). Forms will be filled out with waterproof ink. The label will be protected from water and solvents with clear label protection tape. Sample numbers will be recorded in the sample log book.

FIELD NOTEBOOK

A record of sample identification numbers and chain-of-custody will be maintained in the field team leader's notebook. Additionally, it will include a record of significant events, observations, and measurements during field investigations: personnel present, site conditions, drilling procedures, sampling procedures, measurement procedures, and calibration records. Field measurements recorded on standardized forms will be maintained in the project notebook.

All entries will be signed and dated, and kept as a permanent record. The information contained in these forms is intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. Corrections of erroneous entries will be made by crossing a line through the error and entering the correct information. Corrections will be initialed and dated by the person making the entry.

CHAIN-OF-CUSTODY

Official custody of samples must be maintained and documented from the time of sample collection up to the presentation of analytical results in the final report. Each sample at Montrose will be in the sampler's custody and the sampler will be personally responsible for the care and custody of the samples until they are dispatched or delivered to the laboratory. The QA project manager will review all procedures to determine whether proper custody procedures were followed during the field work and decide if additional samples are required.

When transferring samples, the individuals relinquishing and receiving will sign, date, and note the time on the Chain-of-Custody Record (Figure 3). This record documents sample custody transfer. Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier name(s), and other pertinent information will be entered in the "Remarks" section of the Chain-of-Custody Record. All shipments will be accompanied by the Chain-of-Custody Record identifying its contents. Originals and copies will be sent to the appropriate parties as indicated on the form.

Once received at the laboratory, laboratory custody procedures will apply. However, a separate chain-of-custody record will be prepared for those samples to be split at the laboratory. At that point, it will be the laboratory's responsibility to acknowledge receipt of samples and verify that the containers have not been opened. It is then the laboratory's responsibility to maintain custody records throughout sample preparation and analysis.

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Project No.	Project Name					NUMBER OF CONTAINERS						REMARKS
Samplers: (Signature)												
Sample Number	Date	Time	Comp	Grab	Station Location							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)		
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

FIGURE 3 CHAIN OF CUSTODY RECORD

AUDIT PROCEDURES

The Quality Assurance Manager (QAM) will monitor and audit the performance of the QA procedures outlined in the QAPP. The QAM will conduct field and office audits which will insure that the information being gathered is reliable and of good quality.

FIELD AUDITS

The QAM may schedule audits of field activities at various times to evaluate the execution of sample collection, sample identification, sample control, chain-of-custody procedures, field documentation, instrument calibration and other field measurement and sampling operations.

Field documents pertaining to sample identification and control will be examined for completeness and accuracy. Field notebooks and field data forms will be reviewed to see that all entries are dated and signed and that the contents are legible, written in ink, and contain accurate and inclusive documentation of project activities. Because the notebook and field data forms provide the basis for reports written later, they will contain only facts and observations. Language will be objective, factual, and free of personal interpretations or other terminology not appropriate to the data collection activities.

The auditor will also check to see that chain-of-custody procedures are being followed and that samples are being kept in custody at all times and are locked or otherwise stored to prevent tampering.

Sampling operations will be evaluated periodically to determine if they are performed as stated in the project plan or as directed by the project manager. The auditor checks to determine that the appropriate number of samples are being collected, samples are placed in proper containers, and proper preservation, packaging, and shipment protocols are being followed.

Field measurement activities will be evaluated to determine if they are performed according to QAPP guidelines. The auditor will spot check various instruments for proper calibration, the frequency of calibration, and that the techniques utilized with these instruments are providing accurate data.

OFFICE AUDITS

Once a field project has been completed, the individual files will be assembled, organized, and securely stored. The documents are examined to determine that all necessary items such as signatures, dates, and project codes are included. The auditor examines all classified documents and determines if they are being handled and stored in the proper manner.

In addition to the formal audits performed, the project manager continually reviews product quality as draft documents are produced and insures that the project is being performed in accordance with approved quality assurance procedures. Prior to the production of a draft report, all work products receive independent review by senior project staff and/or senior staff from the technical disciplines which were utilized in performing the work. This will include review of calculation briefs, test analyses, field measurements, graphs, tables, and any document which involves generating information from the field data.

CORRECTIVE ACTION PROCEDURES

Corrective action procedures that might be implemented from audit results regarding detection of unacceptable data must be developed on a case-by-case basis. Such actions might include altering original data procedures in the field, using a different batch of sample containers, increasing calibration and maintenance schedules of field measurement instruments, or recommending an audit of laboratory procedures. The project manager is responsible for initiating the corrective action. The QAM is responsible for approving the corrective action.

HARGIS + ASSOCIATES, INC.

APPENDIX A

LABORATORY QUALITY CONTROL

APPENDIX A

CONTENTS

QUALITY ASSURANCE AND CHAIN-OF-CUSTODY

Brown and Caldwell maintains a comprehensive quality assurance program based on guidelines established by the United States Environmental Protection Agency (USEPA)[a]. Our program begins in the field where samples are collected and is carried through each step of the analytical process, report preparation, and final disposition of the samples.

SAMPLE COLLECTION

Advanced planning is essential to the collection of samples. Sampling equipment, appropriate containers and preservatives, and holding times are a few of the considerations which must be made to minimize possibilities for contamination or unnecessary delays which threaten the integrity of the sample. Precision and accuracy are meaningless without the proper collection of a representative sample. Quality assurance starts out with our experienced field personnel. Sample bottles are clearly marked and all pertinent observations recorded along with sample description, time samples, data sampled, and initials of the collector.

SAMPLE CONTROL

Verification of sample integrity is one of the main responsibilities of our sample control officer. The sample will be inspected to see that it was collected with the following considerations:

1. Sample identification -- the sample must be clearly marked and dated.

[a] U.S. Environmental Protection Agency Publication 600/4-79-020

2. The sample must be collected in the most appropriate container for the individual analysis, whether it be glass, plastic, or a special vial to avoid headspace.

3. The sample must be properly preserved.

4. There must be an adequate volume for all analyses involved.

If the above conditions are met, the sample will be given a log number and the description, date received, and client's name are all recorded along with any other relevant information. If aliquots or subsamples are to be split, care is taken to ensure that the subsamples are representative of the original. Blending or grinding may be required.

Another major task of the sample control officer is to establish a chain-of-custody. The sample must be accounted for from the time of collection to the time of disposal. Samples are normally held for 30 days after completion of the analyses; however, longer holding periods are negotiable.

ANALYTICAL

Brown and Caldwell's analytical quality control procedures require each set of analyses be accompanied by a number of control operations. The results of these data are compared against established norms in order to make sure the analysis is under control.

For example, the analysis of a set of six to ten wastewater samples for, say, ammonia would typically involve the following quality control measures.

.. A three-to-four point calibration curve bracketing the concentrations of ammonia in the samples is constructed.

.. A method (reagent) blank run is made.

.. A laboratory control standard containing a known amount of the analyte in distilled water is determined daily.

.. At least one replicate determination is made.

.. At least one sample is spiked with a known amount of analyte and the percent recovery calculated.

.. Wherever possible, a field blank is analyzed.

.. A field replicate is analyzed if available.

.. The method detection limit may be redetermined.

Results for the laboratory control and spike recovery samples are measured against norms established by prior laboratory experience. If either results differs from the expected value by more than three standard deviations, the method is said to be "out of control" -- all work is stopped until the problem has been resolved. During the week following an "out of control" situation, quality control checks are made more frequently than the usual 10 to 15 percent.

Results are often confirmed by making use of an alternative method. For instance, calcium may be determined by atomic absorption, ion chromatography, or EDTA titrimetric methods. Volatile fatty acids may be determined by titration of a steam distillate or, with speciation, by gas, high performance liquid or ion chromatography methods. Ammonia may be determined by colorimetric, titrimetric, amperometric, or ion chromatographic methods.

Analytical performance is also monitored on a regular basis through the following:

1. Participation in the interlaboratory or round-robin programs.

2. Participation in the USEPA's check sample program.

3. Analysis of internal blank check samples submitted by the quality assurance officer.

4. Validation of data by analysis of samples by both Emeryville and Pasadena laboratories, independently.

MISCELLANEOUS CHECKS OF ACCURACY

Wastewater analyses in particular often provide the analysts with unusual challenges such as interferences not discussed in the standard analytical reference manuals. Such difficulties, which would otherwise escape detection, are often revealed by other frequently applied checks on accuracy. For example, an erroneously high sulfite value was found and corrected in the course of establishing a cation/anion balance.

Where applicable, correlations may be established for total organic carbon, biochemical oxygen demand, chemical oxygen demand, and other parameters. Dissolved solids and conductance often serve as checks against each other. Mass balance calculations will also assist in identifying error if flow rates of a system are known. All of the above considerations are essential to quality assurance in providing an added means of identifying error.

Where trace analysis is involved, purity of the water, solvents, reagents, and gases employed is of great concern. The highest quality chemicals appropriate for a particular analysis, including solvents especially prepared for pesticide analysis, are used throughout. A well-equipped dish-washing facility provides clean glassware. Glassware used in trace metal analysis is treated with aqua regia while organics glassware is dried in a muffle furnace at 500 degrees after washing.

EQUIPMENT MAINTENANCE

Brown and Caldwell maintains service contracts on all major instrumentation, i.e., gas chromatographs, atomic absorption, ion chromatography, and total organic carbon analyzers are all serviced and maintained regularly. Balances and spectrophotometers are also checked on a regular basis. Programmable calculators are provided to minimize the human error in repetitive calculations.

CHAIN-OF-CUSTODY

Brown and Caldwell's chain-of-custody procedures have been established to document the identity of a sample and its handling from the time of collection until its ultimate disposal.

Proper sample handling techniques begin with a well-planned sample collection program which includes having sample bottles precleaned and labeled. When sample bottles are requested by a client, they are appropriately prepared and preservatives added in advance. This assists in eliminating contamination or degradation of samples.

Sample identification in the field initiates a chain-of-custody record which is provided with the bottles and remains with the sample throughout its handling. This includes the transfer of samples from the field crew to the laboratory and, in some cases where necessary, to the subcontractors' laboratory.

Upon receipt at the laboratory, sample integrity is verified by the sample control officer as discussed above. Each sample is then assigned a discrete log number which will identify the sample recorded in the custody record and in the legally required sample log book maintained at Brown and Caldwell. When samples are received through a carrier, an acknowledgement of sample reception is immediately mailed to the client. However, arrangements are typically made to immediately contact the client by phone if problems are identified.

GENERATIONS OF REPORTS

The sample control officer prepared a work sheet for each sample, based on information recorded in the sample log book. The work sheet is forwarded to the laboratory supervisor who schedules the work upon consultation with the appropriate section head. Upon completion, the results are recorded in a bound analysis log book and on the work sheet. The work sheet is then turned in for typing.

The typed copy is reviewed by both laboratory supervisor and laboratory manager before being sent out to the client. A copy of the results is filed along with the raw data which includes chromatograms, printouts, and quality control information. These are kept on file for a minimum of five years.